

**MALCOLM
PIRNIE**

ARCS II



Contract No. 68-W9-0051

Focused Feasibility Study FIELD SAMPLING PLAN

**Chemsol, Inc. (Tang Realty)
Piscataway Township
Middlesex County, New Jersey**

**Remedial Planning Activities at Selected
Uncontrolled Hazardous Substance Disposal Sites
USEPA Region II (NY, NJ, PR, VI)**

**Malcolm Pirnie, Inc.
2 Corporate Park Drive
White Plains, New York 10602**

March 1991

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ARCS II CONTRACT NO. 68-W9-0051

WORK ASSIGNMENT # 013-2LC3

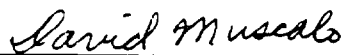
SITE NAME: CHEMSOL, INC. FFS

FIELD SAMPLING PLAN

CONTRACTOR QA/QC SIGN-OFF

Malcolm Pirnie, Inc. has reviewed this draft document in accordance with the contractor's ARCS II QAPP and is submitting it to USEPA, Region II in compliance with the requirements under Work Assignment No. 013-2LC3 and Contract No. 68-W9-0051.

This document has not been approved by USEPA Region II and is not intended for release to the public.



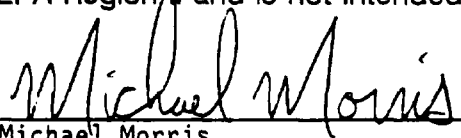
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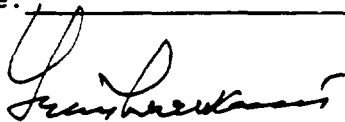
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1.0 INTRODUCTION

This Field Sampling Plan (FSP) describes in detail the procedures that will be followed to conduct field activities for the Focused Feasibility Study (FFS) at the Chemsol, Inc. site in Piscataway, New Jersey. The purpose of the FSP is to assure that samples are collected and handled properly until the samples reach the laboratory and sampling and handling procedures are fully documented. This will assure that samples are representative of the media sampled, cross-contamination of samples does not occur, samples are properly preserved and samples are analyzed for the appropriate constituents. The sampling and data gathering methods described in the FSP are consistent with the U.S. Environmental Protection Agency's (EPA) "Compendium of Superfund Field Operations Methods" (EPA/540/P-87/001, OSWER Direction 9355.0-14, December 1987), and Malcolm Pirnie's Standard Operating Procedures.

Each field member will be required to read this document and to fully understand the procedures that are to be followed in the field before beginning work at the site. In addition, each field member will be required to read the Site Health and Safety Plan (SHSP) that has been prepared for the project before initiating field activities.

It is recognized that once sampling activities begin, field conditions may be different from conditions expected. As a result, it may be necessary to change some of the procedures described in the FSP. The Malcolm Pirnie Site Quality Assurance Officer and ARCS II PMO QA Manager/Deputy Manager and the EPA will be advised of the need to change procedures in the FSP. After the changes have been agreed to, the revised procedures will be fully documented and attached to the FSP as an addendum. Copies of the FSP and the SHSP will be maintained at the field office at all times.

2.0 SITE BACKGROUND

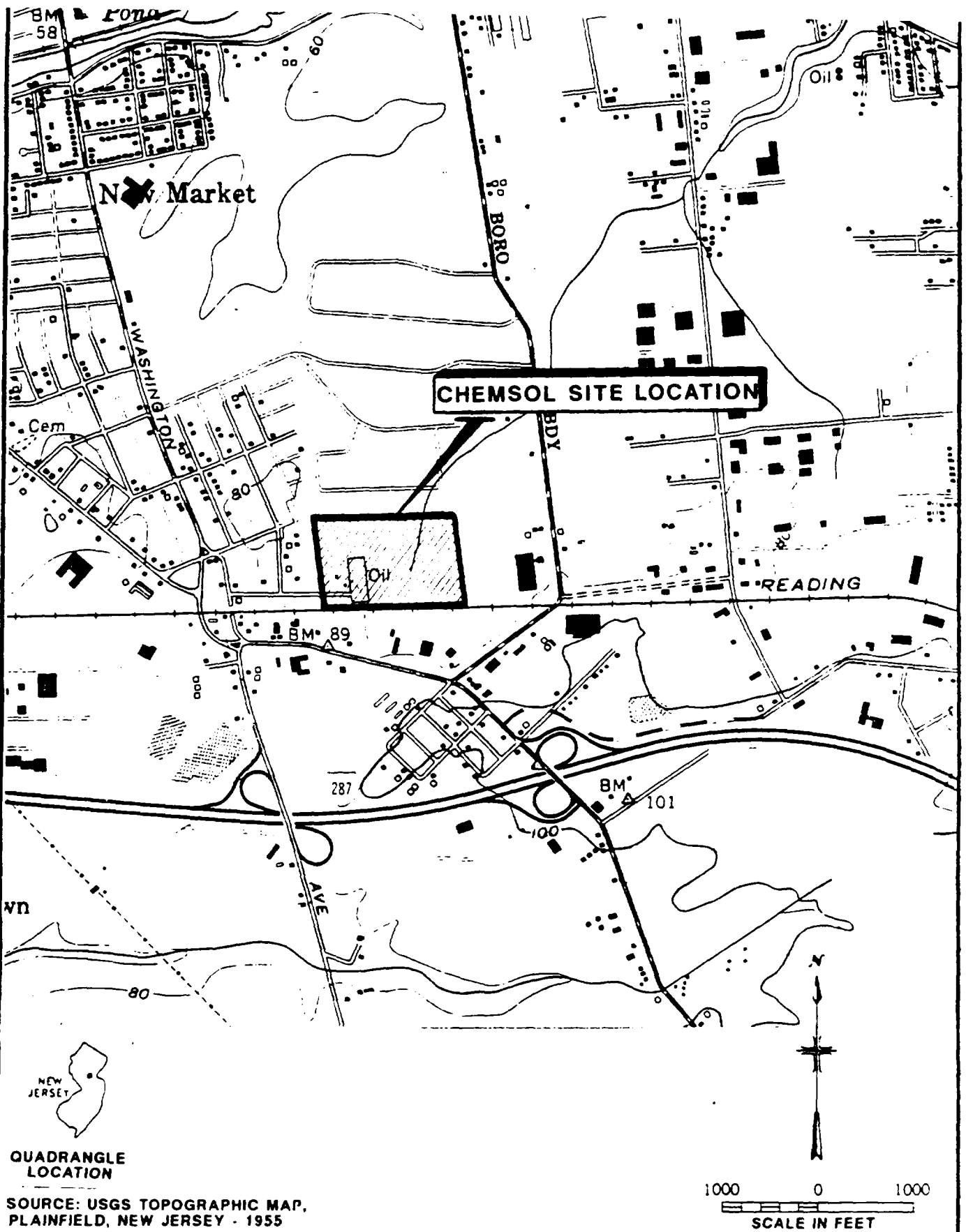
2.1 SITE DESCRIPTION

The Chemsol, Inc. (CI) site is a 40-acre tract located on Fleming Street in the Township of Piscataway, Middlesex County, New Jersey (Figures 2-1 and 2-2). Interstate Route 287 is located approximately one-half mile south of the site. The Reading Railroad right-of-way is located adjacent to the southern property boundary. Single family residences are located immediately west and southwest of the site. Industrial and retail/wholesale businesses are located south and east of the site. An apartment complex is located north of the site.

The site was razed in the mid-1960's and no man-made structures remain on the site. The surface elevation of the CI site is approximately 80 feet above mean sea level. The ground surface slopes toward the north and elevation decreases several feet from south to north.

2.2 GEOLOGIC AND HYDROGEOLOGIC SETTING

The site is located in the lowland of the Triassic-age Piedmont physiographic province. The site is underlain by the interbedded, reddish-brown to gray sandstone, siltstone and claystone of the Passaic (formerly Brunswick) Formation. The formation is dominated by massively bedded siltstones characteristic of broad channel deposits. These units have been intruded by igneous rocks regionally. In the vicinity of the CI site, no igneous intrusions, contact metamorphic effects or alterations have been observed. The formation is monoclinial and has a uniform northeast-southwest strike. The dip is approximately 10 degrees northwest. At the CI site, the bedrock is generally 3 to 20 feet below ground surface. The reddish-brown soils on the site are residual, derived from the weathering of the bedrock. They are composed of silt and clay with some sand.

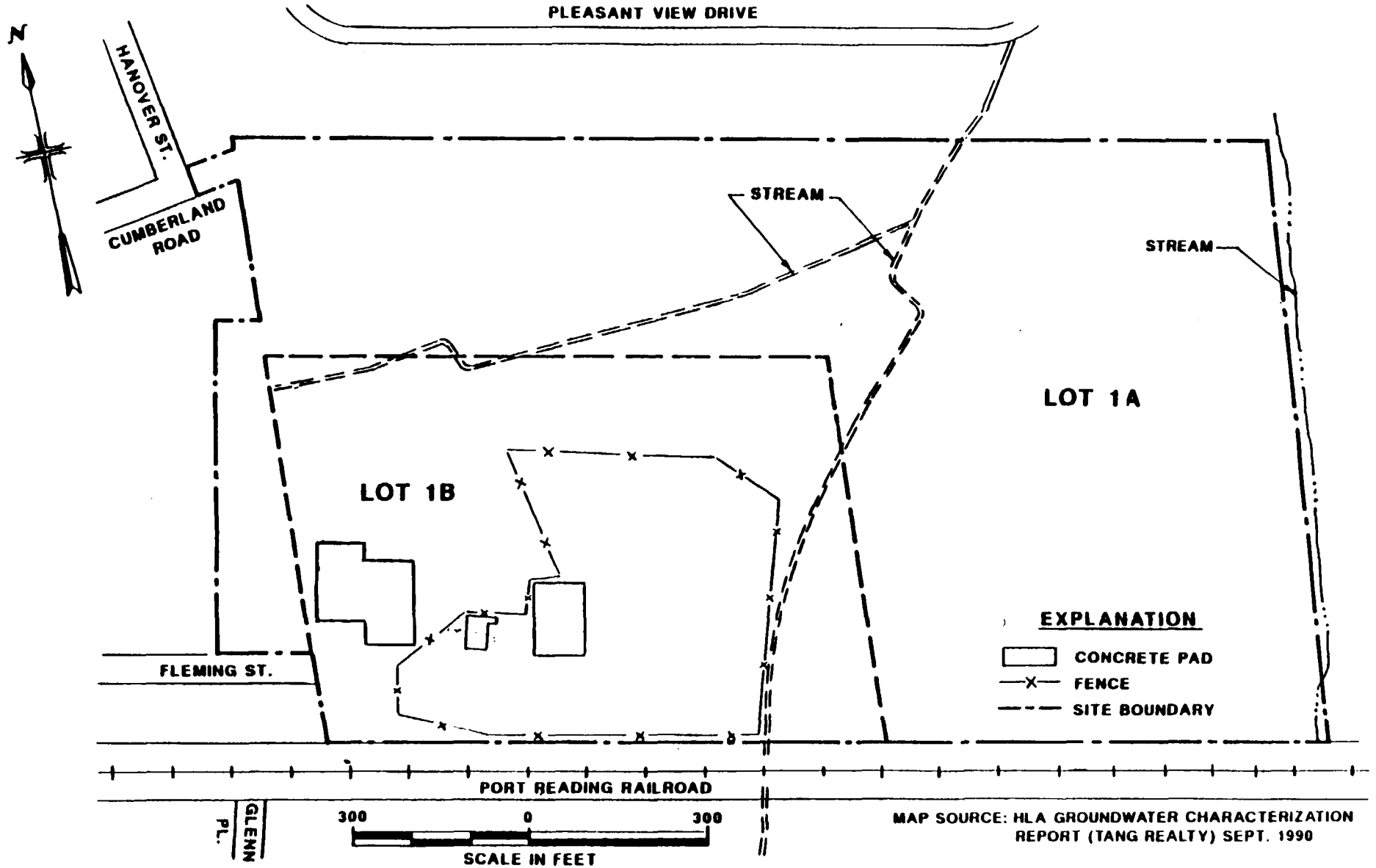


**MALCOLM
PIRNIE**

CHEMSOL INCORPORATED (TANG REALTY) SITE
PISCATAWAY TOWNSHIP, MIDDLESEX COUNTY, NEW JERSEY
SITE LOCATION MAP

MALCOLM PIRNIE, INC

FIGURE 2-1



**MALCOLM
PIRNIE**

TOTO TOO SWO

CHEMSOL, INC.
PISCATAWAY TOWNSHIP, NEW JERSEY

SITE PLAN

MALCOLM PIRNIE, INC

FIGURE 2-2

Ground water occurs in a perched zone located at the interface of the soil and top of rock. This zone is generally located at a depth of less than five feet. Ground water movement in the perch zone is reported to be to the northeast. The water table occurs at approximately 25 to 30 feet below ground surface. Ground water occurs at this depth in interconnected fractures in the bedrock. These fractures impart a secondary porosity to the rock and provide flow paths along which water moves. Water table ground water movement is reported to be the southeast and is believed to be influenced by the pumping wells at Parkway Plastics. The direction of water movement in the bedrock is primarily controlled by fracture orientation.

2.3 SITE HISTORY

In the 1950's and 1960's, the CI site was occupied by a chemical reprocessing firm known at various times as Chemsol Corporation and Chemsol, Inc. Operations at the site included solvent recovery and plastics manufacturing. The current owner of the site is Tang Realty, Inc.

Historically, there have been several fires and explosions at the CI site. In September 1958, a still exploded on the site. In June 1961, a fire started when a 50 gallon drum of Hexane solvent exploded. In June 1962, a fire started when a pile of approximately 500,000 pounds of wax was ignited by a spark from a nearby tractor. In October 1964, a reaction of Aluminum Chloride and water generated hydrogen chloride gas which resulted in the evacuation of the area in the vicinity of the site.

The owner was ordered by the Township in 1964 to cease operations. The plant was dismantled the following year (1965) and operations ceased at the site. Several large mounds of plastic wastes were left behind. In 1976, a grass fire ignited one of the mounds. The Piscataway Fire Inspector subsequently signed a complaint against Tang Realty for failure to clear the waste mounds. In 1978, the site was rezoned from industrial to residential.

Since 1983, the New Jersey Department of Environmental Protection has ordered Tang Realty to perform a number of site investigations related to ground water contamination under Administrative Orders. Investigations have been conducted from 1980 to 1990 by J.W. Patterson & Associates, Lancy Laboratories Division of Lancy International, Applied Geotechnical and Environmental Services Corporation and Harding Lawson Associates. The investigations have revealed that the soils and ground water on the site have been

contaminated with polychlorinated biphenyls (PCBs), volatile organic compounds, semivolatile organic compounds and metals. Table 2-1 shows the compounds which have been reported in the ground water. However, the vertical and horizontal extent of contamination has not been adequately delineated. Therefore, the EPA notified Tang Realty (in November 1990) that Federal funds would be used to identify the nature and extent of the release (or threatened release) of hazardous substances and to evaluate remedial alternatives to address these releases.

TABLE 2-1
HISTORICAL CONTAMINANT DATA
CHEMSOL, INC.

COMPOUND	FREQUENCY OF DETECTION	CONCENTRATIONS (ug/L)		
		MIN	MAX	AVG
ORGANIC COMPOUNDS				
Vinyl Chloride	4/32	6	430	119
Chloroethane	1/32	3.2	3.2	3.2
Methylene chloride	12/32	1.8	9500	1813
Acetone	2/4	270	15000	7635
1,1-Dichloroethene	2/4	20	840	430
1,1-Dichloroethane	3/32	8.8	320	289.6
1,2-Dichloroethene (Total)	2/4	330	20000	10165
Chloroform	22/32	2.4	19000	2642
1,2-Dichloroethane	16/32	2	6700	1215
1,1,1-Trichloroethane	7/32	1.7	14000	2145.5
Carbon Tetrachloride	20/32	0.65	10000	1322.7
1,2-Dichloropropane	4/32	6	160	58.5
Trichloroethene	22/28	1.7	45000	4870.4
1,1,2-Trichloroethane	1/32	2.5	2.5	2.5
Benzene	14/32	1.1	11000	1950.4
4-Methyl-2-Pentanone	1/4	4800	4800	4800
2-Hexanone	1/4	5000	5000	5000
Tetrachloroethene	8/28	3	8700	1221.1
1,1,2,2-Tetrachloroethane	1/32	830	830	830
Toluene	19/32	1.3	12000	2098
Chlorobenzene	2/32	680	1800	1240
Ethylbenzene	1/32	890	890	890
Xylene (total)	6/32	9	3800	1373
Diethylphthalate	1/4	8	8	8
Di-n-Butylphthalate	1/4	2	2	2

TABLE 2-1
HISTORICAL CONTAMINANT DATA
CHEMSOL, INC.

COMPOUND	FREQUENCY OF DETECTION	CONCENTRATIONS (ug/L)		
		MIN	MAX	AVG
bis(2-Ethylhexyl) Phthalate	1/4	4	4	4
Di-n-Octylphthalate	2/4	0.2	0.6	0.4
bis(2-Chloroethyl) Ether	1/4	51	51	51
1,3-Dichlorobenzene	2/32	3.2	4	3.6
1,4-Dichlorobenzene	1/32	37	37	37
1,2-Dichlorobenzene	7/32	2.4	4200	880.8
2-Methylphenol	1/4	360	360	360
Isophorone	1/4	18	18	18
2,4-Dimethylphenol	1/4	5	5	5
Benzoic Acid	1/4	160	160	160
1,2,4-Trichlorobenzene	1/4	54	54	54
Naphthalene	1/4	46	46	46
2-Methylnaphthalene	1/4	2	2	2
4-Nitrophenol	1/4	0.6	0.6	0.6
Dibenzofuran	1/4	0.5	0.5	0.5
Dichlorofluoromethane	2/28	17	19	18
1,1-Dichloroethene	3/28	23	560	294.3
trans-1,2-Dichloroethene	14/28	2.8	30000	3493
Phenol	1/4	54	54	54
INORGANICS				
Aluminum	3/4	320	1400	753
Antimony	1/4	2	2	2
Arsenic	4/4	4	5	4.25
Barium	4/4	120	380	253
Calcium	4/4	41000	200000	84,500
Iron	4/4	11000	45,000	24250
Lead	4/4	5	10	7

TABLE 2-1
HISTORICAL CONTAMINANT DATA
CHEMSOL, INC.

COMPOUND	FREQUENCY OF DETECTION	CONCENTRATIONS (ug/L)		
		MIN	MAX	AVG
Magnesium	4/4	13,000	23,000	19000
Manganese	4/4	87	3,800	1,089
Potassium	4/4	1,100	2,700	1,775
Selenium	1/4	1	1	1
Sodium	4/4	9,800	20,000	13,950
Zinc	4/4	180	2800	1345

Note: Data from Harding Lawson Associates 9/90 report. Includes TCL/TAL, 601 and 602 analyses on ground water. Data from packer testing not included.

3.0 SAMPLING OBJECTIVES

The purpose of the field activities proposed under the FFS for the site is to obtain baseline water quality data for the perched ground water zone and the water table ground water zone above 110 feet below grade. These shallow ground waters are expected to be the most highly contaminated at the site. Baseline water quality and sediment quality data will also be obtained for the on-site surface water body (stream) located at the eastern site border which will be evaluated for the potential of receiving treated ground water from the CI site. Hydraulic conductivity data will also be collected for the perched ground water zone.

The results of these investigations will be used to assess the potential risks that contamination in the ground water at the CI site presents to human health and the environment and to evaluate feasible interim remedy alternatives to contain and remediate the shallow ground water. As a result, the data generated during field activities and by the laboratory must be carefully collected and analyzed. The purpose of the Field Sampling Plan is to establish a protocol so that field data and samples are properly collected and handled until they reach the laboratory and the laboratory assumes sample custody. Therefore, results should be representative of actual field conditions.

4.0 SAMPLE LOCATIONS, FREQUENCY AND DESIGNATION

4.1 INTRODUCTION

Field activities are proposed at the Chemsol, Inc. site to provide baseline water quality data for the perched ground water zone and the shallow water table zone on the site. Baseline water quality and sediment quality data will also be collected for the on-site surface water body (stream) near the eastern border of the site to evaluate its potential for receiving treated ground water from the CI site. Collection of surface water and ground water samples for chemical analysis will be conducted. The following sections identify each sample matrix to be collected and the constituents to be analyzed. In addition, quality assurance/quality control (QA/QC) samples will be collected for each matrix to assure that the data meet the necessary quality objectives. Table 4-1 summarizes the number of samples and QA/QC samples to be collected. In the following sections, each type of QA/QC sample is described, and the number of QA/QC samples to be collected is described. The numbering system to be used to identify each sample is also presented. Detailed sampling procedures are provided in Section 5.0.

4.2 SAMPLE LOCATIONS AND FREQUENCY

4.2.1 Surface Water Samples

Surface water samples will be collected for chemical analysis from the on-site stream near the eastern border of the site. Sufficient surface water quality data will be collected to satisfy the requirements of a New Jersey Pollutant Discharge Elimination System - Discharge to Surface Water Permit (NJPDES-DSW). To satisfy these requirements, water samples will be collected weekly for a total of eight weeks from the on-site stream. Two of the weekly sampling events will take place during a period of low fresh water flows, which is generally between August 15 and October 15. During each weekly sampling event, three samples will be collected from a near bank location representative of a potential discharge point. The samples will be analyzed for the parameters indicated in Tables 4-2 and 4-3. In addition to the surface water sampling, one sediment sample must be collected from the on-site stream to satisfy NJPDES-DSW requirements. This will be performed during one weekly sampling event. The sediment will also be analyzed for the parameters listed in Tables 4-2 and 4-3.

TABLE 4-1
PLANNED SAMPLE AND ANALYSIS SUMMARY
CHEMSOL, INC.

<u>Sample Matrix</u>	<u>Sample Frequency⁽¹⁾</u>			
	<u>TCL⁽²⁾ VOC</u>	<u>TCL⁽²⁾ Organics</u>	<u>TAL⁽²⁾ Inorganics</u>	<u>SAS⁽²⁾ Parameters</u>
<u>Monitoring Wells</u>				
Ground Water Samples	22	22	22	22
Trip Blanks ⁽³⁾	5	-	-	-
Field Blanks ⁽³⁾	5	5	5	5
Lab MS/MSD Samples ⁽⁴⁾	2	2	2	2
Field Duplicates	2	2	2	2
<u>Surface Water</u>				
Water Samples	3	3	3	3
Trip Blanks ⁽³⁾	1	-	-	-
Field Blanks ⁽³⁾	1	1	1	1
Lab MS/MSD Samples ⁽⁴⁾	1	1	1	1
Field Duplicates	1	1	1	1
<u>Stream Sediment</u>				
Sediment Samples	1	1	1	1
Trip Blanks ⁽³⁾	-	-	-	-
Field Blanks ⁽³⁾	1	1	1	1
Lab MS/MSD Samples ⁽⁴⁾	1	1	1	1
Field Duplicates	1	1	1	1

Notes:

1. Sample frequencies indicated are for each sampling event.
2. Target Compound List (TCL) Volatile Organic Compounds (VOCs), Base/Neutral, Acid Extractables (BNAs), Pesticides/PCBs, and Target Analyte List (TAL) Inorganics are listed in Table 4-2. SAS parameters are listed in Table 4-3. All analyses will be performed by a CLP laboratory.
3. The blank water used must be demonstrated analyte-free prior to the start of field sampling. Trip blanks will be taken at a minimum frequency of one per day when volatile organics in an aqueous matrix are being collected. One field blank will be collected for each type of equipment used each day a decontamination event is carried out. The number of trip and field blanks given is estimated. The actual number will depend on the number of sampling days.
4. For each Lab MS/MSD sample required for aqueous samples, three times the volume of the chosen sample is required for organics analyses; a single volume is required for inorganic analyses. No additional volume is required for sediment samples.

The limit on a sample delivery group for matrix spike/matrix spike duplicate analyses are the following:

- i. Each case of field samples or
- ii. Each 20 field samples within a case, or
- iii. Each fourteen calendar day period during which field samples in a case are received (said period beginning with the receipt of the first sample in the sample delivery group), whichever comes first.

TABLE 4-2

TARGET COMPOUND LIST/TARGET ANALYTE LIST
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)⁽¹⁾

CHEMSOL, INC.

<u>Volatiles</u>	<u>Water (ug/L)</u>	<u>Low Soil/Sediment (2,3) ug/kg</u>
Chloromethane	10	10
Bromomethane	10	10
Vinyl Chloride	10	10
Chloroethane	10	10
Methylene Chloride	5	5
Acetone	10	10
1,1-Dichloroethene	5	5
1,1-Dichloroethane	5	5
1,2-Dichloroethene (total)	5	5
Carbon Disulfide	5	5
Chloroform	5	5
1,2-Dichloroethane	5	5
2-Butanone	10	10
1,1,1-Trichloroethane	5	5
Carbon Tetrachloride	5	5
Vinyl Acetate	10	10
Bromodichloromethane	5	5
1,1,2,2-Tetrachlorethane	5	5
1,2-Dichloropropane	5	5
cis-1,3-Dichloropropene	5	5
Trichloroethene	5	5
Dibromochloromethane	5	5
1,1,2-Trichloroethane	5	5
Benzene	5	5
Trans-1,3-Dichloropropene	5	5
Bromoform	5	5
2-Hexanone	10	10
4-Methyl-2-pentanone	10	10
Tetrachloroethene	5	5
Toluene	5	5
Chlorobenzene	5	5
Ethyl Benzene	5	5
Styrene	5	5
Xylenes (Total)	5	5

TABLE 4-2

TARGET COMPOUND LIST/TARGET ANALYTE LIST
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)⁽¹⁾

CHEMSOL, INC.

<u>Semivolatiles</u>	<u>Water (ug/L)</u>	<u>Low Soil/Sediment (2,3) ug/Kg</u>
Phenol	10	330
bis(2-Chloroethyl) ether	10	330
2-Chlorophenol	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
 Benzyl Alcohol	 10	 330
1,2-Dichlorobenzene	10	330
2-Methylphenol	10	330
bis(2-Chloroisopropyl) ether	10	330
4-Methylphenol	10	330
N-Nitroso-Dipropylamine	10	330
Hexachloroethane	10	330
Nitrobenzene	10	330
Isophorone	10	330
2-Nitrophenol	10	330
2,4-Dimethylphenol	10	330
Benzoic Acid	50	1600
bis(2-Chloroethoxy) methane	10	330
2,4-Dichlorophenol	10	330
1,2,4-Trichlorobenzene	10	330
Naphthalene	10	330
4-Chloroaniline	10	330
Hexachlorobutadiene	10	330
4-chloro-3-methylphenol (para-chloro-meta-cresol)	10	330
2-Methylnaphthalene	10	330
Hexachlorocyclopentadiene	10	330
2,4,6-Trichlorophenol	10	330
2,4,5-Trichlorophenol	50	1600
2-Chloronaphthalene	10	330
2-Nitroaniline	50	1600

TABLE 4-2

TARGET COMPOUND LIST/TARGET ANALYTE LIST
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)⁽¹⁾

CHEMSOL, INC.

<u>Semivolatiles</u>	<u>Water (ug/L)</u>	<u>Low Soil/Sediment (2,3) ug/Kg</u>
Dimethyl Phthalate	10	330
Acenaphthylene	10	330
2,6-Dinitrotoluene	10	330
3-Nitroaniline	50	1600
Acenaphthene	10	330
2,4-Dinitrophenol	50	1600
4-Nitrophenol	50	1600
Dibenzofuran	10	330
2,4-Dinitrotoluene	10	330
Diethylphthalate	10	330
4-Chlorophenyl Phenyl Ether	10	330
Fluorene	10	330
4-Nitroaniline	50	1600
4,6-Dinitro-2-methylphenol	50	1600
N-nitrosodiphenylamine	10	330
4-Bromophenyl Phenyl Ether	10	330
Hexachlorobenzene	10	330
Pentachlorophenol	50	1600
Phenanthrene	10	330
Anthracene	10	330
Di-n-butylphthalate	10	330
Fluoranthene	10	330
Pyrene	10	330
Butyl Benzyl Phthalate	10	330
3,3'-Dichlorobenzidine	20	660
Benzo(a)anthracene	10	330
Chrysene	10	330
bis(2-ethylhexyl)phthalate	10	330
Di-n-octyl Phthalate	10	330
Benzo(b)fluoranthene	10	330
Benzo(k)fluoranthene	10	330
Benzo (a) pyrene	10	330
Indeno(1,2,3-cd)pyrene	10	330
Dibenzo(a,h)anthracene	10	330
Benzo(g,h,i)perylene	10	330

TABLE 4-2

TARGET COMPOUND LIST/TARGET ANALYTE LIST
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)⁽¹⁾

CHEMSOL, INC.

<u>Pesticides/PCBs</u>	<u>Water (ug/L)</u>	<u>Low Soil/Sediment (2,3) ug/Kg</u>
alpha-BHC	0.05	8.0
beta-BHC	0.05	8.0
delta-BHC	0.05	8.0
gamma-BHC (Lindane)	0.05	8.0
Heptachlor	0.05	8.0
Aldrin	0.05	8.0
Heptachlor Epoxide	0.05	8.0
Endosulfan I	0.05	8.0
Dieldrin	0.10	16.0
4,4'-DDE	0.10	16.0
Endrin	0.10	16.0
Endosulfan II	0.10	16.0
4-4'-DDD	0.10	16.0
Endosulfan Sulfate	0.10	16.0
4,4'-DDT	0.10	16.0
Endrin Ketone	0.10	16.0
Methoxychlor	0.5	80.0
alpha-chlordane	0.5	80.0
gamma-chlordane	0.5	80.0
Toxaphene	1.0	160.0
Aroclor-1016	0.5	80.0
Aroclor-1221	0.5	80.0
Aroclor-1232	0.5	80.0
Aroclor-1242	0.5	80.0
Aroclor-1248	0.5	80.0
Aroclor-1254	1.0	160.0
Aroclor-1260	1.0	160.0

TABLE 4-2
 TARGET COMPOUND LIST/TARGET ANALYTE LIST
 CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)⁽¹⁾

CHEMSOL, INC.

<u>Inorganics</u>	Contract Required ⁽⁴⁾
	Detection Level (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

TARGET COMPOUND LIST/TARGET ANALYTE LIST
CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)⁽¹⁾

CHEMSOL, INC.

NOTES:

- (1) Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.
- (2) Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.
- (3) Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semi Volatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticide/PCB TCL compounds are 15 times the individual Low Soil/Sediment CRQL.
- (4) These CRDL are the instrument detection limits obtained in pure water. The detection limits for samples may be considerably higher depending on the sample matrix.

TABLE 4-3

SPECIAL ANALYTICAL SERVICES PARAMETERS
CHEMSOL INC.Volatiles and Semi-Volatiles

Acrolein⁽¹⁾
 Acrylonitrile⁽¹⁾
 Benzidine⁽¹⁾
 1,2-Diphenylhydrazine⁽¹⁾
 (as Azobenzene)
 N-Nitrosodimethylamine⁽¹⁾
 Total PAHs⁽²⁾
 Total Nitrophenols⁽²⁾
 Total Halomethanes⁽²⁾

Pesticides/PCBs

Total PCBs⁽²⁾

Dioxins

2,3,7,8 - TCDD

Inorganics

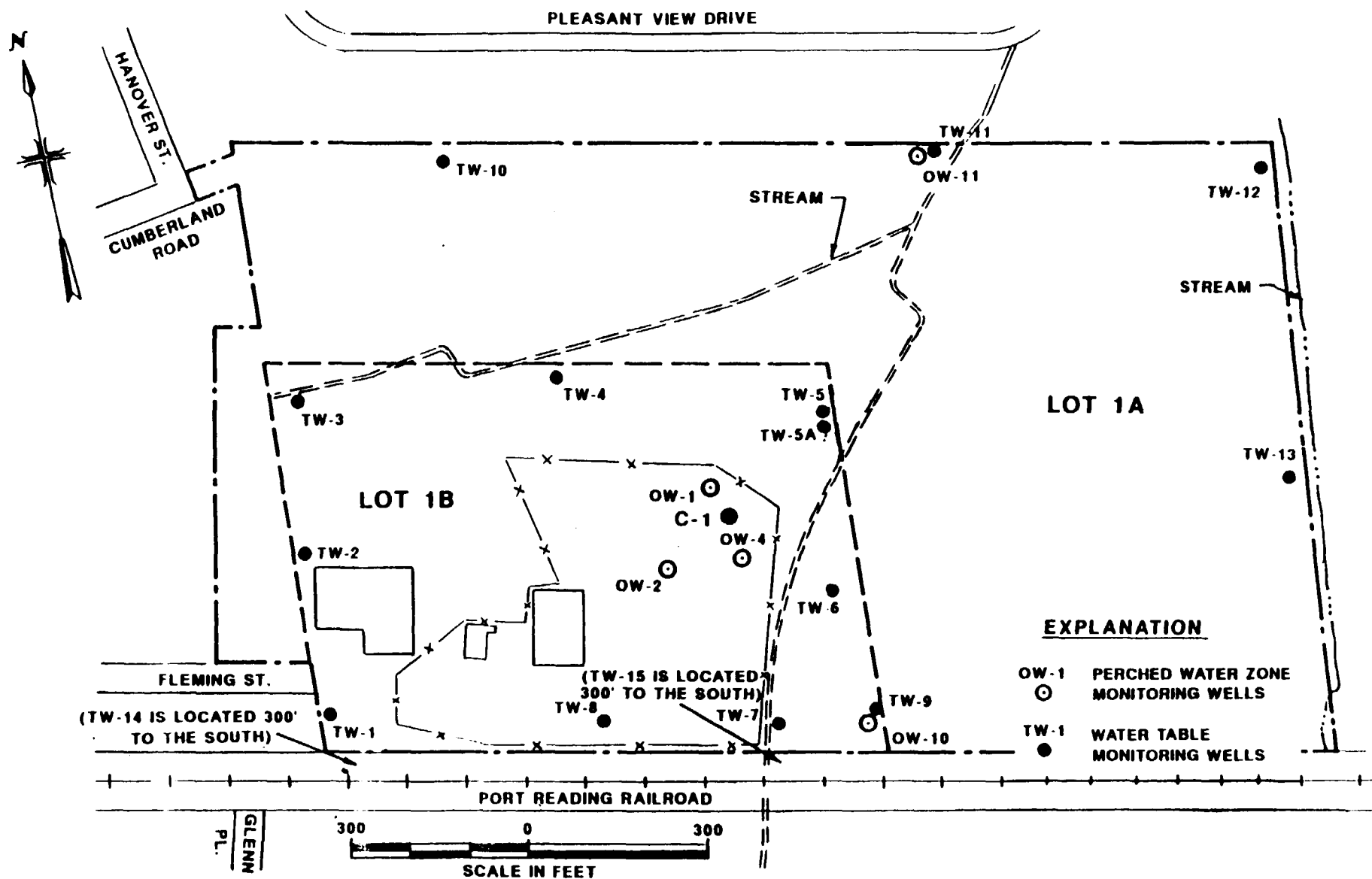
Bromide⁽³⁾
 Chloride
 Chlorine Produced Oxidants⁽³⁾
 (Total Residual Chlorine)
 Sulfate (as SO₄)

Note:

- (1) These organics will not be identified during the CLP-TCL organics scan. Analyzing for these organics will be a special analytical service.
- (2) These parameters will be totalled by Malcolm Pirnie upon receipt of CLP analytical data.
- (3) Sediment will not be analyzed for this parameter.

Wet Chemistry Parameters

Alkalinity⁽³⁾
 Ammonia
 Biological Oxygen Demand⁽³⁾
 Chemical Oxygen Demand⁽³⁾
 Hardness⁽³⁾
 MBAS⁽³⁾
 Oil and Grease, Total
 Recoverable
 Total Dissolved Solids⁽³⁾
 Total Organic Carbon
 Total Petroleum Hydrocarbons
 Total Phosphorus⁽³⁾
 Total Suspended Solids⁽³⁾



**MALCOLM
PIRNIE**

CHEMSOL, INC.
PISCATAWAY TWP., N.J.

MALCOLM PIRNIE, INC.

GROUND WATER SAMPLING LOCATIONS

FIGURE 4-1

BTIO 100 SWJ

4.2.2 Ground Water Monitoring Wells

Ground water samples will be collected from twenty-two monitoring wells located at the CI site. Known well locations are shown on Figure 4-1. Ground water samples will be collected from each well for analysis of the parameters indicated in Table 4-2 and 4-3.

4.3 QUALITY CONTROL SAMPLES

Quality control procedures will be employed to check that sampling, transportation and laboratory activities do not bias sample chemical quality. Trip blanks, field blanks, duplicate samples, matrix spike samples and matrix spike duplicate samples will provide a quantitative basis for validating the analytical data.

4.3.1 Blank Water

Blank water used in this project will be demonstrated analyte-free prior to the start of sample collection through the performance of analytical testing. For the sampling at the CI site, the blank water will be deionized water obtained from the MPI Environmental Laboratory. Malcolm Pirnie will provide analytical results for each lot of deionized water demonstrating that the water meets USEPA Region II requirements. The blank water will be obtained from the laboratory in certified clean containers and will be stored in coolers which will be kept separate from sources of possible contamination. The results, including copies of all documentation, will be submitted to the USEPA Region II Quality Assurance Officer (QAO) for this site prior to the start of field sampling. A copy of the analytical results will be provided to the site managers for site files. A copy will be also brought to the field. The USEPA Region II criteria for analyte-free is as follows:

Purgeable Organics	<10 ppb
Semi-Volatile Organics	<CRQL
Pesticides	<CRQL
PCBs	<CRQL
Inorganics	<CRDL

Specifically for the common laboratory contaminants listed below, the allowable limits are three times the respective CRQLs.

Methylene Chloride

Acetone
Toluene
2-Butanone
Phthalates

4.3.2 Trip Blanks

Trip blanks will be taken for each aqueous medium being sampled for volatile analysis at a minimum frequency of one per day. The trip blank is prepared by the laboratory by filling a 40 ml Teflon lined septum vial with distilled/deionized analyte-free water. The vial is shipped to the site with the sample containers and accompanies the sample containers at all times. One trip blank will be returned to the laboratory with each day's shipment of samples scheduled for analysis. The trip blank will be analyzed for volatile organic compounds to detect possible contamination during shipment.

4.3.3 Field Blanks

A field blank consists of an empty set of laboratory-cleaned sample containers. At the field location, demonstrated analyte-free water, as described in Section 4.3.1, is passed through decontaminated sampling equipment and placed in an empty set of sample containers for analysis of the parameters indicated in Table 4-1. One field blank will be collected for each type of equipment used each day a decontamination event is carried out. It is permissible to use the same aliquot of water on all equipment associated to a particular sample matrix for analysis of semi-volatile organics, pesticides, PCBs and inorganics. This rinse must be performed sequentially on all sampling equipment. However, a separate field rinse blank must be collected for each piece of equipment associated to a particular sample matrix which will be analyzed for volatile organics.

4.3.4 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike and matrix spike duplicate (MS/MSD) sample pairs are analyzed by the laboratory to provide a quantitative measure of the laboratory's precision and accuracy. The limits on a sample delivery group (SDG) are the following:

- i. Each case of field samples or
- ii. Each 20 field samples within a case, or

- iii. Each fourteen calendar day period during which field samples in a case are received (said period beginning with the receipt of the first sample in the SDG), whichever comes first.

Aqueous samples require that three times the volume of the sample selected for each MS/MSD sample be collected and submitted to the laboratory for organics analysis. A single volume of inorganic aqueous samples is required for each sample selected for MS/MSD analysis. MS/MSD samples are selected in the field by the field team.

4.3.5 Field Duplicate Samples

For each sample matrix, a field duplicate sample will be collected at a rate of one sample per 20 environmental samples. The duplicate sample is collected at the same location as the environmental sample. The field duplicate sample is then given a fictitious identification using the sample designation system described in Section 4.4. The identity of the field duplicate is not revealed to the laboratory. The analytical results of the environmental sample will be compared to those of the field duplicate sample to evaluate the precision of the field sampling procedures.

4.4 SAMPLE DESIGNATION

A sample numbering system will be used to identify each sample. This system will provide a tracking procedure to allow retrieval of information about a particular sample and will assure that each sample is uniquely numbered. The sample identification will consist of at least three components as described below. Each matrix spike and matrix spike duplicate will be identified with the suffix MS or MSD.

- **Project Identification:** The first component consists of a two letter designation which identifies the project site. For this project, the two letter designation will be CI.
- **Sample Type:** The second component, which identifies the sample type, will consist of a two letter code as follows:

MW - Monitoring Well (ground water sample)
SW - Surface Water

- Sample Location: The third component identifies the sample location or identifies if the sample is a trip blank or field blank. The monitoring well number will be used to identify ground water sample locations. A two digit number will be used to identify each surface water sampling location. TB will be used to identify a trip blank and FB will be used to identify a field blank.
- Quality Assurance/Quality Control Samples will be labelled with the following suffixes:

MS - Matrix Spike
MSD - Matrix Spike Duplicate

Duplicate samples will be numbered uniquely as if they were samples. A record of identification for duplicate samples will be maintained.

Examples of identification numbers are given below:

CI-MW-TW7: Ground water sample collected from monitoring well TW-7.

CI-SW-TB: Trip blank for surface water.

In addition to the Malcolm Pirnie sample designation, samples submitted to an USEPA CLP laboratory are identified with USEPA CLP sample numbers, provided by the laboratory. Examples of USEPA CLP sample numbers are given below:

ABC 01: EPA organic sample identification number.

DEFG 01: EPA inorganic sample identification number.

5.0 SAMPLING PROCEDURES AND EQUIPMENT

5.1 INTRODUCTION

The following sections provide step-by-step instructions for each type of field activity that is to be conducted at the site. These procedures will be followed by the field team in order to maintain the necessary data quality objectives.

5.2 MOBILIZATION

The following facilities will be provided prior to the start of the field work:

- Temporary decontamination pad;
- Staging area for equipment, supplies, and drums to temporarily store disposable clothing and other contaminated materials.
- Wind Socks - Two wind socks will be set up at a central location. One sock will be located 5 feet above ground surface and the second will be located 10 feet above ground surface. These will be used to determine the prevailing wind direction during the air monitoring program.

5.3 AIR MONITORING

5.3.1 Sampling Objectives

Air monitoring will be conducted during field operations to measure volatile organic contaminant levels and respirable dust levels. The purpose of the air monitoring is to evaluate contaminant levels in the workers' breathing zone in order to select appropriate personal protective equipment.

5.3.2 Sampling Equipment

- HNu Systems, Inc., PI-101 Photoionization Detector (HNu)
- MIE, Inc., Miniram Model PDM-3 (Miniram)
- Field Notebook.

5.3.3 Sampling Procedures

During well sampling and slug testing, air monitoring will be conducted at the following locations and time intervals:

- Workers' breathing zone (every 15 minutes)
- At the well head space (every 15 minutes)

The HNu will be used to measure levels of volatile organic vapors and the Miniram will be used to measure dust levels. The direction of wind movement will be recorded by observing the wind socks located on the site. The date, time, location, instrument readings, and direction of wind will be recorded in a field notebook.

The calibration procedures for each instrument are provided in Appendix A. Each instrument will be calibrated at the start of each day. In addition, each instrument will be recalibrated before use if it is turned off during the day.

5.4 SLUG TESTING

5.4.1 Testing Objectives

Because of the low permeability of site soils and the low yield of the perched ground water zone, slug tests will be conducted on all of the OW-series wells. These wells are screened solely in the perched ground water zone. The tests will be implemented to determine soil permeability near each of the wells. These data will be used to assess the feasibility of a remediation system for the perched zone consisting of a trench(s) with a collection/extraction well(s).

5.4.2 Testing Equipment

- Electronic data logger
- Pressure transducer
- Electronic water level indicator
- Field notebook
- PVC or galvanized steel slug

5.4.3 Testing Procedures

A known volume of water is either added to or removed from a monitoring well. Alternatively, the change in water level can be created by either introducing or removing an object of known volume (a slug) from the well. A maximum change in water level of about one foot is desirable. The resulting recovery of the water level in the well to the static depth is monitored. The permeability of the formation is then calculated by an equation based on the Theim assumptions and developed by Bouwer and Rice. The method is discussed in a paper entitled, "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells" in Volume 12, Number 3 of Water Resources Research. This method is appropriate for use on the data gathered from the wells at the site because it is developed for fully or partially penetrating wells under unconfined conditions. These conditions match those of the OW-series wells at the site. The Bouwer and Rice equation is given as:

$$K = \frac{rc^2 \ln (Re/rw)}{2L} \frac{1}{t} \ln \frac{Y_o}{Y_t}$$

where: K = Permeability, in ft/sec

Y_o = Water level prior to slug addition, in feet

Y_t = Water level at any time after slug addition, in feet

t = Time since slug addition, in seconds

rw = Radial distance between the undisturbed aquifer and the well center, in feet

L = Height of screen or perforated zone, in feet

rc = Inside radius of casing with allowance for porosity if water level rises in the perforated section, in feet

Re = Equivalent radial distance over which head loss occurs, in feet

ln (Re/rw) = is calculated empirically using the following equation:

$$\ln (Re/rw) = \left[\frac{1.1}{\ln (H/rw)} + \frac{A + B \ln [(D - H) / rw^{-1}]}{L/rw} \right]^{-1}$$

where: A is a constant taken from Figure 3 of Bouwer and Rice

B is a constant taken from Figure 3 of

Bouwer and Rice

D = Thickness of the affected aquifer, in feet

H = Penetration depth of the well into the
aquifer, in feet

The field method described above will be checked in the office by using computer analysis of the slug-test data. The USGS-generated program for permeability testing which is based on the method of Hvorslev (1951) will be used. This method was developed for wells under confined conditions and is not as applicable for assessing data from the site wells as the Bouwer and Rice method. Application of this method as a check, however, will aid in identifying problems with the collected data or analysis by Bouwer and Rice.

It should be noted that slug tests are not an accurate method of calculating the permeability of an aquifer and that the test provides information only on the formation extending a few inches beyond the well borehole. The data obtained may not be representative of the aquifer.

5.5 COLLECTION OF GROUND WATER SAMPLES FROM MONITORING WELLS

5.5.1 Sampling Objectives

Ground water samples will be collected from the wells for analysis of the parameters listed in Tables 4-2 and 4-3. These data will be used to assess ground water treatment alternatives.

5.5.2 Sampling Equipment

The following equipment will be needed to collect ground water samples for analysis:

- Interface meter
- HNu
- Dissolved Oxygen meter
- Submersible pump
- Centrifugal pump
- Polyethylene tubing
- Stainless steel bailers
- Teflon-coated leader cord
- Bailer cord
- pH meter
- Temperature and specific conductivity meter

- Field notebook and field logs
- Laboratory-prepared sample containers
- Roll of plastic

The submersible pump will be water cooled and constructed of stainless steel. Neoprene, PVC, Tygon silicon rubber or viton will not be used in the pump construction. Any down-hole equipment having neoprene fittings, PVC, tygon tubing, silicone rubber bladders, neoprene impellers, or viton are not acceptable.

5.5.3 Sampling Procedures

A piece of polyethylene sheeting will be laid on the ground beside each well and the sampling equipment and sample bottles will be placed on the polyethylene sheeting. At each location, the locking steel cap and internal well cap will be removed. The air quality of the headspace and breathing zone will be monitored with an HNu and explosimeter.

The battery of the interface indicator will be checked by pushing the battery check button. The instrument will then be turned on and the probe will be slowly lowered into the well. The sensor in the probe has made contact with the water surface in the well when a single light appears on the instrument. If two lights appear and the buzzer sounds, the probe has made contact with a floating or sinking non-aqueous phase liquid. The depth of water and any non-aqueous phase liquids will be recorded to the nearest one-hundredth of a foot from the top of the internal well casing. The date, time, well number, and air quality measurements will also be recorded. The interface indicator will be decontaminated before collecting a measurement in each well by following the procedures outlined in Appendix B.

The water volume in the casing will be calculated using the following equation:

$$V = 3.1416 (r^2 h) \text{ (Note: 1 cu. ft. = 7.48 gallons)}$$

where:

pi = 3.1416
V = standing water volume (gallons)
r = well casing radius (feet)
h = height of water column (feet)

Clean, new polyethylene tubing will be attached to the submersible pump, which will be decontaminated between well locations as described in Appendix B. The pump will be

lowered into the well. If a centrifugal pump is used, clean tubing equipped with a check-valve will be lowered into the well. During evacuation, the pump intake will not be set greater than six feet below the dynamic water level. This requires that the pump be lowered as purging continues and the water level drops.

Each well will be purged until a maximum of three to five volumes of standing water is evacuated or until the well is near dryness. The volume of water removed from each well that is not pumped dry is dependent upon field measurements of pH, temperature and specific conductivity. When each of these parameters has stabilized, the volume of water removed will be recorded and the well will be sampled. If the parameters do not stabilize, purging will continue until 3 to 5 volumes of water are removed. The purge water will be collected in a tanker and disposed of off-site in an approved facility.

The ground water sample will be collected by gently lowering a stainless steel bailer into the well. Teflon-coated cord will be used for bailer cord which contacts the ground water. The bailer will be retrieved and the sample will be transferred to the appropriate sample containers. The samples will therefore be grab and not composite. The vial provided for volatile organics will be filled first, without leaving any head space or air bubbles. All other sample bottles will be filled to the shoulder. The head space will allow for expansion/contraction of the sample. Ground water for metals analysis will not be filtered in order to measure the total quantity present.

If a non-aqueous phase liquid is detected, a sample will be collected for analysis. The phase must be collected prior to any purging activities. If the thickness of a light or floating phase is two feet or greater, a bottom valve bailer will be used to collect the sample. The bailer will be lowered slowly until contact is made with the surface of the non-aqueous phase and lowered to a depth less than that of the phase/water interface depth as determined by the initial measurement with the interface probe. When the thickness of the floating layer is less than two feet, but the depth to the surface of the floating layer is less than 25 feet, a peristaltic pump can be used to collect a sample.

When the thickness of the floating layer is less than two feet and the depth to the surface of the floating layer is beyond the effective reach of a peristaltic pump (greater than 25 feet), a bailer must be modified to allow filling only from the top. Sampling personnel will disassemble the bottom check valve of the bailer and insert a piece of 2-inch diameter fluorocarbon resin sheet between the ball and ball seat. This will seal off the bottom valve. The buoyancy that occurs when the bailer is lowered into the floater can be overcome by

placing a length of 1-inch stainless steel pipe on the retrieval line above the bailer. The device should be lowered carefully until the top of the bailer is level with the top of the floating layer. The bailer should be lowered an additional one-half thickness of the floating layer and the sample collected.

A double check valve bailer will be used for collecting dense non-aqueous phase liquids. The sample will be collected by controlled, slow lowering (and raising) of the bailer to the bottom of the well.

The sample bottles will be placed into coolers and will be sent to a USEPA CLP laboratory for analysis. Sample handling procedures are detailed in Section 6.0.

Field measurements of pH, specific conductance and temperature and dissolved oxygen will be made in each well. The meters will be calibrated before they are used. The calibration procedures are provided in Appendix A.

The bailer and any equipment entering the well will be handled with new nitrile gloves to prevent contamination. Nitrile gloves will be changed between each sample location.

Data to be recorded in the field logbook will include the following:

- Name and location of job
- Well and sample identification numbers
- Date of sample collection
- Method of purging and sample acquisition
- Depth to water
- Volume of water removed during purging
- pH, temperature and specific conductivity measurements
- Organic gas and methane levels

All entries will be dated and initialled.

5.6 COLLECTION OF SURFACE WATER AND SEDIMENT SAMPLES

5.6.1 Sampling Objectives

Surface water samples will be collected for chemical analysis from the on-site stream near the eastern border of the site which has been identified to potentially receive treated ground water from the CI site. Sufficient surface water quality data will be collected to satisfy the requirements of a New Jersey Pollutant Discharge Elimination System - Discharge to Surface Water Permit (NJPDES-DSW). To satisfy these requirements, water samples will be collected weekly for a total of eight weeks from the on-site stream. Three samples will be collected during each week sampling event. For non-tidal streams, two of the weekly

sampling events must take place during a period of low fresh water flows, which is generally between August 15 and October 15. The New Jersey Bureau of Coastal Resources reports that the stream is not tidal.

In addition to the surface water sampling, one sediment sample must be collected from the on-site stream to satisfy NJPDES-DSW requirements. This will be performed during one weekly sampling event. If surface water samples are collected at the same time as the sediment sample, the water samples shall be collected first.

5.6.2 Sampling Equipment

- Stainless steel trowel
- Stainless steel ladle
- Field notebook
- Laboratory prepared bottles
- Stop watch
- Float
- Ruler

5.6.3 Sampling Procedures

The water and sediment samples will be collected from near the bank of the stream. Water samples will be collected from the projected point of discharge and one location upstream and one location downstream. These locations will be staked so that the same locations can be sampled during each sampling event.

The water samples will be collected with a stainless steel ladle by dipping into the stream. The sediment sample will be collected with a stainless steel trowel. Both sample types will be grab and not composite. Sampling instruments will be decontaminated before use following the procedures described in Appendix B. The sample will be slowly transferred to laboratory prepared bottles. The vial provided for volatile organics will be filled first, without leaving any head space or air bubbles. All other sample bottles will be filled to the shoulder. The head space will allow for expansion/contraction of the sample. The aqueous sample collected for metals analysis will not be filtered.

The sample bottles will be placed into coolers and will be sent to a USEPA CLP laboratory for analysis. Sample handling procedures are detailed in Section 6.0.

The sampling equipment and sample jars will be handled with new nitrile gloves to prevent contamination. Nitrile gloves will be changed between each sample location.

Field measurements of pH, specific conductance, temperature and dissolved oxygen will be made for each water sample. The meters will be calibrated before they are used following the calibration procedures provided in Appendix A.

Data to be recorded in the field logbook will include the following:

- Name and location of job
- Sample identification number
- Method of sample collection
- Weather conditions
- Date of sample collection
- Description of sampling location including stream depth
- pH, temperature, specific conductivity and dissolved oxygen measurements

Following sample collection, the flow rate of the stream will be measured. First, a stream velocity will be measured by placing a floating object in the stream above the upstream sampling location. The time required for the object to float unobstructed from the upstream to downstream sampling locations will be measured. This figure will be divided into the distance between the sampling locations to obtain a stream velocity in units of length per unit of time.

Next, the cross-sectional area of the stream will be determined at the projected discharge point. The stream is generally about five feet in width at the site, therefore, five depth measurements will be collected at one-foot intervals across the stream bed. The depth will be measured by lowering a weighted line into the water. The five depth measurements will be averaged.

The flow rate of the stream will then be calculated using the following formula:

$$Q = wdu$$

where Q = discharge in cubic feet per second
 w = width of the stream, in feet
 d = average depth of the stream, in feet
 u = velocity in feet per second

The flow rates collected during each sample event will be compared to determine when lower flow conditions occur.

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6.0 SAMPLE HANDLING

6.1 GENERAL

Representative sampling of environmental matrices for chemical analysis depends on proper collection, preservation, shipping, custody and preparation techniques. Unpreserved or improperly shipped samples may jeopardize sample integrity and reduce data quality. To assure that sampling data are reliable, Malcolm Pirnie will adhere to procedures described in the following sections and in the Quality Assurance Project Plan prepared for the investigation. All samples collected for analysis by the USEPA CLP will be labeled, packaged and preserved according to CLP procedures which are described in the "Users Guide to the CLP."

6.2 PROCUREMENT AND PREPARATION OF SAMPLE CONTAINERS

Malcolm Pirnie will purchase certified clean, approved sample containers from an approved supplier. Malcolm Pirnie will label and prepare all bottles and add preservatives, where necessary. Copies of certifications will be kept in site files and brought to site while sampling.

6.3 LABELING OF SAMPLES

All samples collected at the site will be identified with a Malcolm Pirnie sample label and a Malcolm Pirnie sample tag. The sample label will be attached to each bottle that contains a sample and will be covered with clear plastic tape to assure that the label does not peel off or become damaged. A unique sample number will be assigned to each sampling location and marked on the label and the tag. The sample tag will be attached to the sample bottle with wire or string. In addition to the Malcolm Pirnie label and tag, all samples submitted to the CLP Laboratory will be identified with EPA CLP numbers which are provided by the CLP Laboratory.

All samples labels and tags will contain the following information:

1. Project Number
2. Field ID or sample station number
3. Date and time of collection
4. Designation of sample as grab or composite
5. Sample matrix
6. Sample preservation notes
7. Analytical parameters
8. Signature of sampler

The project number is used instead of the site name in order to preserve the anonymity of the site. The bottles will be pre-numbered according to the Field Sampling Plan's numbering scheme.

The sample label and tag will be checked by the laboratory to be sure that they are identical and then will be cross-referenced to the chain-of-custody form. Any inconsistencies will be noted on the chain-of-custody form. All identifying tags, data sheets, and laboratory records will be retained as part of the permanent record.

6.4 SAMPLE PRESERVATION/HOLDING TIMES

The analytical laboratory will analyze samples for the constituents given in Tables 4-2 and 4-3. The samples will be analyzed by following USEPA CLP/RAS and SAS methodologies. Information on sample containers, preservation techniques, and holding time limits is presented in Table 6-1.

6.5 SAMPLE SHIPPING AND CHAIN-OF-CUSTODY

The sample handling and sample custody procedures described below will be followed during all sampling events. A chain-of-custody form (Figure 6-1) will be sent by the laboratory and will accompany the sample bottles from the laboratory into the field. Upon receipt of the bottles and cooler, the sampler will sign and date the first "received" blank space. After each sample is collected and appropriately identified, entries will be made on the chain-of-custody form which will include: sample names and signatures, sampling station identification, date, time, type of sample and the required analysis. In addition, the USEPA CLP Traffic Report Forms and SAS Packing List are initiated at the time of sample collection

TABLE 6-1

SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS
CHEMSOL, INC.

<u>Matrix</u>	<u>Analysis</u>	<u>Procedure</u>	<u>Container</u>	<u>Preservation</u>	<u>Holding Time</u>
Ground Water/ Surface Water	Volatiles	CLP(1)	2-40 ml glass VOA vial	HCl to pH<2, Cool to 4 C	14 days, preserved
	Acrolein	CLP(1)	2-40 ml glass VOA vial	HCl to pH 4-5 Cool to 4C	14 days, Preserved
	Acrylonitrile	CLP (1)	2-40 ml glass VOA vial	HCl to pH 4-5 Cool to 4C	14 days, Preserved
	Semi-Volatiles	CLP(1)	2 L amber glass	Cool to 4 C	7 days (4) 60 days (5)
	Benzidine	CLP(1)	2 L amber glass	Cool to 4 C	7 days (4) 60 days (5)
	1,2-Diphenylhydrazine (as Azobenzene)	CLP(1)	2 L amber glass	Cool to 4 C	7 days (4) 60 days (5)
	N-Nitrosodimethylamine	CLP(1)	2 L amber glass	Cool to 4 C	7 days (4) 60 days (5)
	Pesticides/PCBs	CLP(1)	2 L amber glass	Cool to 4 C	7 days (4) 60 days (5)
	Inorganics (Metal only)	CLP(2)	1 L Polyethylene	MNO ₃ to pH<2 Cool to 4C	180 days
	Alkalinity	USEPA 310.1 ⁽³⁾	1 L Polyethylene	Cool to 4 C	14 days
	Ammonia	USEPA 350.2 ⁽³⁾	1 L Polyethylene	H ₂ SO ₄ to pH<2	28 days
	BOD	USEPA 405.1 ⁽³⁾	1 L Polyethylene	Cool to 4 C	48 hours
	COD	USEPA 410.4 ⁽³⁾	1 L Polyethylene	H ₂ SO ₄ to pH<2	28 days
	Hardness	USEPA 130.2 ⁽³⁾	1 L Polyethylene	MNO ₃ to pH<2	6 months
	MBAS	USEPA 425.1 ⁽³⁾	1 L Glass	Cool to 4 C	48 hours
	TOC	USEPA 415.2 ⁽³⁾	1 L Polyethylene	H ₂ SO ₄ to pH<2 Cool to 4 C	28 days
	Total Phosphorus	USEPA 365.4 ⁽³⁾	1 L Polyethylene	2 ml conc. H ₂ SO ₄ Cool to 4 C	28 days
	Petroleum Hydrocarbons	USEPA 418.1 ⁽³⁾	1 L Glass	5 ml HCl Cool to 4 C	28 days
	Oil & Grease, Total Recoverable	USEPA 413.2 ⁽³⁾	1 L Glass	5 ml HCl Cool to 4 C	28 days
	TSS	USEPA 160.1 ⁽³⁾	1 L Polyethylene	Cool to 4 C	7 days
	TDS	USEPA 160.3 ⁽³⁾	1 L Polyethylene	Cool to 4 C	7 days
	Chloride	USEPA 325.1 ⁽³⁾	1 L Polyethylene	Cool to 4 C	28 days
	Bromide	USEPA 320.1 ⁽³⁾	1 L Polyethylene	Cool to 4 C	28 days
	Chlorine Produced Oxidants (total residual chlorine)	USEPA 330.3 ⁽³⁾	1 L Polyethylene	Cool to 4 C	Analyze Immediately

TABLE 6-1
SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS
CHEMSOL, INC.

<u>Matrix</u>	<u>Analysis</u>	<u>Procedure</u>	<u>Container</u>	<u>Preservation</u>	<u>Holding Time</u>
Sediment	2,3,7,8-TCDD	CLP ⁽⁸⁾	2 L Amber Glass	Cool to 4	10 days ⁽⁴⁾ 40 days ⁽⁵⁾
	Sulfate	USEPA 375.2 ⁽³⁾	1 L Polyethylene	Cool to 4 C	28 days
	Volatiles	CLP ⁽¹⁾	2-40 ml/glass VOA vials	Cool to 4 C	10 days
	Acrolein	CLP ⁽¹⁾	2-40 ml/glass VOA vials	Cool to 4 C	10 days
	Acrylonitrile	CLP ⁽¹⁾	2-40 ml/glass VOA vials	Cool to 4 C	10 days
	Semi-Volatiles	CLP ⁽¹⁾	8 ounce glass jar	Cool to 4 C	10 days ⁽⁴⁾ 40 days ⁽⁵⁾
	Benzidine	CLP ⁽¹⁾	8 ounce glass jar	Cool to 4 C	10 days ⁽⁴⁾ 40 days ⁽⁵⁾
	1,2-Diphenylhydrazine (as Azobenzene)	CLP ⁽¹⁾	8 ounce glass jar	Cool to 4 C	10 days ⁽⁴⁾ 40 days ⁽⁵⁾
	N-Nitrosodimethylamine	CLP ⁽¹⁾	8 ounce glass jar	Cool to 4 C	10 days ⁽⁴⁾ 40 days ⁽⁵⁾
	Pesticides/PCB's	CLP ⁽¹⁾	8 ounce glass jar	Cool to 4 C	10 days ⁽⁴⁾ 40 days ⁽⁵⁾
	Inorganics (metal only)	CLP ⁽²⁾	8 ounce glass jar	Cool to 4 C	180 days
	Ammonia	USEPA 350.2 ⁽⁹⁾	1 L Polyethylene	Cool to 4 C	28 days
	TOC	USEPA (6)	1 L glass	Cool to 4 C	14 days
	Petroleum Hydrocarbons	USEPA 418.1 ⁽³⁾⁽⁷⁾	1 L Glass	Cool to 4 C	28 days
	Oil and Grease, Total Recoverable	USEPA 9070 ⁽³⁾	1 L Glass	Cool to 4 C	28 days
	Chloride	USEPA 9250 ⁽³⁾	1 L Polyethylene	Cool to 4 C	28 days
	Sulfate	USEPA 9035 ⁽³⁾	1 L Polyethylene	Cool to 4 C	28 days
	2,3,7,8-TCDD	CLP ⁽⁸⁾	6 oz glass	None	6 months

Notes:

1. USEPA Contract Laboratory Program, Statement of Work for Organic Analysis, 2/88 or most recent statement of work.
2. USEPA Contract Laboratory Program, Statement of Work for Inorganic Analysis 7/88 or most recent statement of work.
3. All conventional extraction and analytical methods are taken from "Methods for Chemical Analysis of Water and Wastes", March 1983 rev., USEPA 600/4-79-020 and "Test Methods for Evaluating Solid Waste", SW-846.
4. To extraction.
5. To analysis.
6. "Determination of Total Organic Carbon in Sediment", July 27, 1988, by L. Kahn of the USEPA.
7. Soxhlet extraction from USEPA Method 9071.
8. SOW for Dioxin Analysis, Revised 8/87, for Aqueous and Soil Samples.
9. Extraction by "Procedures for Handling and Chemical Analyses of Sediment and Water Samples", EPA/CE-81-1, May 1981. The columnetric or titrometric analytical methods will then be used.

CHAIN OF CUSTODY RECORD

EPA Work Assignment Number_____

[illegible]

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

**MALCOLM
PIR'NE**

CHEMSOL, INC. (TANG REALTY)
PISCATAWAY TOWNSHIP, NEW JERSEY
CHAIN-OF-C TODY FORM

MALCOLM PIRNIE, INC.

FIC 6-1

, in the field and copies are shipped with the samples. Copies of these forms are provided in Appendix C.

After sampling has been completed, the sample containers will be wiped with a clean cloth. Sample tags will be attached and the containers will be placed into coolers. Ice packs will be placed in the coolers to keep the samples cold. Packing materials will also be placed in the coolers to keep the sample containers from moving and possibly breaking. The sampler will sign and date the next "relinquished" blank space on the chain-of-custody form.

The samples will be transported to CLP Laboratory under custody of Malcolm Pirnie personnel or they will be shipped by an air express service. If the samples are shipped by an air express service, the name of the carrier will be entered under the next "received" blank and the air bill number will be entered on the form. The chain-of-custody form will be placed in the cooler. Two or more custody seals will be signed, dated and placed on each shipping container, located in a manner that would indicate if the container were opened in transit. Wide, clean tape will be placed over the seals, to ensure that seals are not accidentally broken during shipment. Custody seals must be used at all times, regardless of whether the samples are transported by Malcolm Pirnie personnel or by an air express service. After each sample shipment to USEPA CLP Laboratories, the Sample Management Officer (SMO) will be immediately notified by phone.

All samples will be received by the laboratory within 24 hours of collection. Samples will be received by laboratory personnel, who will assume custody of the samples, and sign and date the next "received" blank on the chain-of-custody form. Upon completion of sampling event, a Trip Report will be prepared by site personnel and submitted to the SMO.

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APPENDIX A
EQUIPMENT CALIBRATION PROCEDURES

CNS 001 0139

EQUIPMENT CALIBRATION PROCEDURES AND FREQUENCY

INTRODUCTION

Instruments must be properly calibrated to produce technically valid data. Documented calibration and calibration check results verify that the instruments used for measurement are in proper working order and the data produced is reliable. The calibration requirements described or referenced in this section are necessary to support the data quality objectives for this project. When calibration requirements are met, the data will support the FFS decisions regarding evaluation of interim remedy alternatives. In the event that the data is used in court, documented calibrations are necessary to ensure that the data is legally defensible.

CALIBRATION PROCEDURES FOR FIELD EQUIPMENT

Field Equipment

The following table provides a list of the tasks that will require field equipment and the specific field instruments that will be used for each task.

<u>Task</u>	<u>Field Instrument</u>
Ground Water and Surface Water Sampling	pH Meter Temperature Probe Specific Conductivity Meter Dissolved Oxygen Meter
Air Monitoring	Photoionization Detector Miniram Model PDM-3
Slug Testing	Data logger with pressure transducer

General Procedures

The operation and maintenance of the field equipment to be used during the air monitoring, slug testing, surface water and ground water sampling tasks are provided in Appendix A of the Quality Assurance Project Plan for the Chemsol Site. Specific calibration procedures for each instrument, except the data logger, water level indicator and interface

meter, are described in this section. No calibration is required for these instruments. General calibration procedures and requirements follow.

- All instruments will be calibrated at least once a month.
- All instruments with the exception of the Miniram will have the calibrations checked at a minimum at the start of each day before measurements are made. The Miniram is calibrated to a representative dust by the rental agency.
- The calibration and calibration checks will indicate that the sensitivity of the instrument (practical detection limit) is adequate to meet project needs and that the instrument is accurate over the working range.
- All calibration information will be recorded in the field log book. This includes date and time, technician signature, calibration procedure, calibration results, calibration problems, recalibration and maintenance, and instrument serial numbers.
- All calibration standards will be of National Bureau of Standards (NBS) quality and their sources listed and documented so that standards are traceable. In addition, only technicians trained in the use of the field instruments will operate them. If the instrument readings are incorrect at the time of the initial calibration, the instrument will either be calibrated by the technician or returned to the manufacturer for calibration. If the instrument readings are incorrect after a continuing calibration check, the preceding sample results will be reviewed for validity and reanalyzed if necessary.

Procedures

Photoionization Detector

With the probe attached to the instrument, the function switch will be turned to the battery check position. The needle on the meter should read within or above the green battery area on the scale plate. If the needle is in the lower position of the battery arc, the instrument should be recharged prior to any calibration. If the red LED turns on, the battery should be recharged. Next, the function switch will be turned to the on position. In this position, the UV light source will be on.

To zero the instrument, the function switch will be turned to the standby position and the zero potentiometer will be rotated until the meter reads zero. Clockwise rotation of the zero potentiometer produces an upscale deflection while the counterclockwise rotation yields a downscale deflection. If the span adjustment setting is changed after zero is set, the zero will be rechecked and adjusted if necessary. The operator will wait 15-20 seconds to ensure that the zero reading is stable. If necessary, the zero will be readjusted.

After the instrument has been zeroed, it will be calibrated using nontoxic gas mixtures available from the manufacturer. The instrument probe will be attached to the gas cylinder with a piece of tubing. The valve of the pressurized container will then be opened until a slight flow is indicated and the instrument draws in the volume of sample required for detection. The span potentiometer will be adjusted so that the instrument is reading the stated concentration of the calibration gas.

If the instrument span setting is changed, the instrument will be turned back to the standby position and the electronic zero will be readjusted if necessary. If the instrument does not calibrate, it may be necessary to clean the probe or the lamp connection.

pH Meter

The pH meter is calibrated before each measurement. To calibrate the instrument, the temperature compensator is first adjusted to the temperature of the water sample. The tip of the probe is then rinsed with deionized water and immersed into a buffer solution with a pH of 7. The meter is then adjusted to read 7.0 and the probe is removed and again rinsed with deionized water. The instrument is checked by immersing the probe into a buffer solution of pH 4.0 (if the sample is expected to have a low pH) or a buffer solution of pH 10 (if the sample is expected to have a high pH). The pH probe is rinsed again, and then immersed into the sample for a measurement. When storing the probe, the tip is immersed in deionized water.

Specific Conductance Meter

Before each measurement of specific conductance, the meter is calibrated by turning the function switch to "red line" and turning the adjustment knob until the needle is aligned with the red line on the meter dial. The function switch is then turned to read conductivity measurements. The instrument readings are checked by immersing the electrode into two buffer solutions with known conductivities. If the readings are not correct, the electrode will be cleaned and then reimmersed into the buffer solutions. If the readings are still incorrect, the instrument will be returned to the manufacturer for repair.

Temperature Probe

To check the temperature instrument, both the probe and a thermometer that is approved by the National Bureau of Standards is immersed into the same beaker of water. Any differences in temperature are noted and recorded in the field log.

Dissolved Oxygen Meter

1. Switch instrument to OFF and adjust meter mechanical zero.
2. Switch to ZERO and adjust to "0" on mg/l scale.
3. Switch to FULL SCALE and adjust to "15" on mg/l scale.
4. Switch to CALIB O₂ position.
5. Place the probe in moist air. B.O.D. probes can be placed in partially filled B.O.D. bottles. The probe can also be wrapped loosely in a damp cloth taking care the cloth does not touch the membrane. Wait approximately 10 minutes for temperature stabilization.
6. With the CALIB Knob, set the meter pointer to the mark for the local altitude. Be sure reading is steady.

Miniram - Model PDM-3

The Miniram Model PDM-3 has been factory-calibrated using a representative dust, but the user may change the calibration constant of the instrument for a specific type of aerosol if he wishes. Such a calibration should be performed by obtaining a concurrent filter collection (e.g., by means of a personal filter sampler), sampling from the same environment within which the Miniram is placed. The average concentration obtained by the Miniram at the end of the test should be compared with the filter-gravimetric-determined concentration. The ratio of the two concentration values can then be used to correct the Miniram calibration. The comparison run should be replicated several times (to minimize errors) to obtain an average ratio.

To change the Miniram calibration, proceed as follows:

1. Place Miniram in a clean environment (e.g., air conditioned office).
2. Remove battery pack.
3. Disconnect battery connector (remember that all stored data will thus be lost/erased from Miniram memory).

4. While leaving battery pack lying next to Miniram, re-connect the two units (i.e., plug in connector).
5. Immediately observe Miniram display. It will be performing a slow segment-by-segment display checkout. As soon as it displays ".00," press OFF, thus interrupting the initial automatic zero check. Wait until the display indicates "OFF" and then press MEAS and wait approximately 36 seconds.
6. Observe 10-second readings (typically in the range of 1 to 3 mg/m³) and record manually a few consecutive readings. Calculate the average of these values.
7. Identify small potentiometer screw (visible through an opening in the foil shield of the open Miniram) opposite the digital output jack. Adjust this potentiometer, using a fine screw driver, until the average Miniram is increased or decreased (with respect to the average obtained in step 6) by the desired ratio (e.g., as determined by previous gravimetric comparison runs).
8. Shut off Miniram, reposition and secure battery pack, and re-zero instrument. All subsequent concentration readings are now corrected by the desired ratio.

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APPENDIX B
DECONTAMINATION PROCEDURES

CMS 001 0145

DECONTAMINATION PROCEDURES

Sampling Equipment

Any equipment that will be used to collect samples, such as stainless steel bailers, stainless steel ladles and stainless steel trowels will be decontaminated at an upwind location on the site, following the procedures described below:

The required decontamination procedure for all sampling equipment is as follows:

- a. wash and scrub with low phosphate detergent
- b. tap water rinse
- c. rinse with 10% HNO₃ ultrapure
- d. tap water rinse
- e. a methanol followed by hexane rinse (solvents must be pesticide grade or better)
- f. Thorough rinse with deionized demonstrated analyte free water (volume of water used during this rinse must be at least 5 times the volume of solvent used in Step e).
- g. air dry, and
- h. wrap in aluminum foil for transport

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute. If metal samples are not being collected, the 10% nitric acid (HNO₃) rinse may be omitted, and conversely, if organic samples are not being taken, the solvent rinse may be omitted.

At the end of each day, the wash and rinse water will be drained into drums or the tanker used to collect purged ground water for proper disposal. Non-interfering containers such as those made of glass, Teflon or stainless steel will be used to transport the hexane.

Field Instrumentation

The interface indicator will be decontaminated before being used in each well by following the procedures described below.

1. Wash probe and cable with Alconox detergent and tap water.
2. Rinse with distilled water. Allow water to drain into tub.
3. Allow instrument to air dry.
4. Place instrument into plastic bag.

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The wash and rinse water will be disposed of as described above.

Other field instrumentation will be cleaned as per manufacturer's instructions. Probes such as those used in pH and conductivity meters will be rinsed after each use with deionized water.

Submersible Pump

The submersible pump will be decontaminated between each use by first pumping 20 gallons of tap water through the pump. The exterior of the pump will then be cleaned with alconox detergent and deionized water. The water will be collected and disposed of as described above.

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APPENDIX C

SAMPLE CUSTODY AND DOCUMENTATION

CMS 001 0148

[illegible]

U.S. ENVIRONMENTAL PROTECTION AGENCY
 CLP Sample Management Office
 P.O. Box 818 - Alexandria, Virginia 22313
 Phone: 703/557-2490 - FTS/557-2490

SAS Number

**SPECIAL ANALYTICAL SERVICE
 PACKING LIST**

Sampling Office: _____ Sampling Contact: _____ (name) _____ (phone)	Sampling Date(s): _____ Date Shipped: _____ Site Name/Code: _____	Ship To: Attn: _____	For Lab Use Only Date Samples Rec'd: _____ Received By: _____
---	---	--	--

Sample Numbers	Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____
11. _____	_____	_____
12. _____	_____	_____
13. _____	_____	_____
14. _____	_____	_____
15. _____	_____	_____
16. _____	_____	_____
17. _____	_____	_____
18. _____	_____	_____
19. _____	_____	_____
20. _____	_____	_____

For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

EMS 001 0151

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL PROTECTION AGENCY - REGION II
Environmental Services Division
EDISON, NEW JERSEY 08817

Name of Unit and Address							
Sample Number	Number of Containers	Description of Samples					
Person Assuming Responsibility for Sample						Time	Date
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody		
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody		
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody		
Sample Number	Relinquished By:	Received By:	Time	Date	Reason for Change of Custody		